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differentiated in three dimensions could divide itself by material means into the elements of an equipotential system." "If each organism produced but one egg, then the materialistic conception of heredity might be true, in which case there need not be of course a regulative restitution; but since the organism produces many eggs, the conception is impossible; because, (I), in order that the developmental phenomena may be deduced materialistically they must be thought of under the assumption of a complicated primary machine, but, (II), on account of the required division of the complex potencies into the elements this assumption cannot be made."

Perhaps these statements may be clearer in the following quotation, in which both the first and the second proofs of the autonomy of the life process are considered together. "The preceding phenomena can be interpreted only on the basis of machines of a complicated sort — but such machines can, for other reasons, not exist. They cannot exist, in the first place, because a machine does not remain the same when we take away any of its parts, or when we rearrange its parts; for machines do not possess the property of division." It can scarcely be claimed by the author that the discovery that organisms are not machines is new, but having admitted this, it does not seem to follow that, therefore, there must be a vitalistic principle in nature. There seems to us to be a great hiatus in Driesch's argument, and in any case his conclusions appear to be based rather on our ignorance of what the organism really is than on a demonstration that it is something that cannot be conceived under a causal-mechanical point of view.

III. In the final section of the paper a number of philosophical and metaphysical topics are discussed, and the author defines his position in regard to the use and meaning of the terms "mechanism" and "causality."

ZOÖLOGY.

Fauna of Switzerland. — The origin of the present fauna of Switzerland from that of the glacial period has been the subject of repeated investigations, but these studies were mainly restricted to the higher forms of terrestrial life. A recent publication by Prof. F. Zschokke[1] not only gives a condensed review of our knowledge of the origin of the Helvetian fauna in general, but preëminently applies the views gained by previous studies to the lower forms of animals that inhabit the fresh-water lakes, streams, etc., of the country.

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[1] Zschokke, F. *Die Tierwelt der Schweiz in ihren Beziehungen zur Eiszeit.* Basel, 1901.

Professor Zschokke points out that the present terrestrial fauna and the present flora belonging to the high mountain regions of the Alps find a counterpart in the arctic regions, the identical species being in many cases represented there. These two main ranges are in some degree connected by intermediate, but isolated and discontinuous, stations on the highest elevations of the intervening low countries, or in localities which, owing to local conditions, possess a particularly cool climate (for instance, peat bogs). It is generally agreed that this peculiar distribution is to be explained as a remnant of the glacial period. During the latter the originally alpine and arctic fauna and flora was widely distributed over the low countries of central Europe, where it found congenial climatic conditions. After the close of the glacial period, at the commencement of a warmer climate, this glacial fauna and flora retreated in two directions: toward the north pole, and toward the high mountains to the south; while in the intervening parts it remained only in a few scattered colder localities, such as the highest summits of the mountains of central Germany. The parts evacuated by this arctic element were occupied by a new stock of life that immigrated chiefly from the east (Siberia).

This is true for plants and terrestrial animals, such as mammals, land mollusks, insects, reptiles; and in many cases we have direct means of ascertaining and verifying this process, since we know glacial and interglacial remains of the respective forms that have been found in the low parts of central Europe.

While it thus seems positively assured, by paleontological facts, that the origin of the alpine flora and terrestrial fauna of Switzerland is to be traced back to glacial times, and lies in the vast country bordering the ice sheet that covered north Europe to the south, we have no such evidence as regards the fresh-water fauna. Nevertheless, Professor Zschokke demonstrates that the distribution of many fresh-water animals of the alpine lakes and streams of Switzerland exhibits the identical peculiar features that are known in terrestrial animals; they reappear in arctic fresh-water basins offering the same climatic conditions, and are wanting in the intermediate tracts except for a few scattered and exceptionally favorable localities. From this similarity in distribution we are to infer that the origin of the distribution of these fresh-water forms was subject to the same laws.

But there is an important difference of the fresh-water fauna from the terrestrial. In the latter, the different faunas, the old glacial and the newer postglacial, are, in the mountains, so to speak, on top of one another, the postglacial fauna occupying the lower parts and ascending the mountains only to a certain elevation, where it gives room to the older fauna, which has taken to the summits. In the fresh-water fauna, however, there is a much larger degree of intermingling; indeed, the postglacial immigrants have been able to reach the most exposed and highest stations in the mountains, and are found everywhere in close vicinity and association with the older glacial elements. According to Zschokke, this fact is due, on the one hand, to the character of the immigrants, which are cosmopolitan, eurytherm forms of life, which may find congenial conditions of existence anywhere; on the other hand, it is due to the peculiarities of temperature in the fresh-water bodies, where the extremes are not so much contrasted and lie closer together than those of the air influencing the terrestrial animals.

The old glacial fauna of the glacial time did not only retreat in these two directions mentioned, but there is a third *refugium* for those that belong to the fresh water. In the depths of the great lakes that fringe the northern foot of the Alps, similar conditions of temperature prevail as in glacial times everywhere in fresh water. These cold depths contain a fauna consisting of peculiar fishes (Salmonidæ) and crustaceans (the latter chiefly pelagic) that point distinctly to a northern origin. These forms apparently immigrated at the close of the glacial period, when there was an abundance of cold water derived from the receding ice. Later, after the abundant supply of water had given out, these forms were cut off from the communication with their northern homes, and their only chance to survive was in these large and cold fresh-water lakes, which resemble their original home at least in temperature.

Thus we may distinguish, among the fresh-water fauna of Switzerland as well as among the terrestrial fauna, two elements: (1) an old glacial stock that lived during the glacial period all over the inhabitable parts of central Europe; and (2) a later immigration in postglacial times. The first one retreated out of the plains in two directions: toward the north pole and toward the mountains. But while for the terrestrial animals which fled to the highlands no other way was left than to go upward, for some of the fresh-water animals a third asylum was open: the deep and cold fresh-water lakes on the northern border of the Alps.

A. E. O.